

REMARKS

This paper is filed in response to the office action mailed on September 29, 2003. Claims 1-2, 6-8 and 9-12 have been amended and claims 3 and 15-20 have been canceled. Claims 1-2 and 4-14 remain pending.

In the office action, the restriction requirement is made final and non-elected claims 15-20 have been canceled.

The office action also objects to the drawings because Fig. 3D shows a trench with d_2 in the mask 42 to be wider than the underlying via hole while the specification states that the trench 42 is narrower. In response, the paragraph bridging pages 7 and 8 of the specification has been clarified to make it clear that the width d_2 of the trench defined by the trench mask 42 is narrower than the width d_1 of the photoresist pattern 40 as shown in Fig. 3C. Applicants respectfully submit that this amendment to the specification traverses the objection to the drawings and therefore no amendments to the drawings are required at this time. Applicants respectfully request that the objections to the drawings be withdrawn.

The office action objects to the abstract as not being entirely consistent with the specification. The abstract has been amended so that it is commensurate in scope with amended claim 1 and the original specification as filed thereby traversing this objection.

The office action also objects to the specification under 35 U.S.C. § 112, first paragraph. In response, the specification has been amended to traverse this objection. Applicants respectfully submit that the specification and drawings are now in full compliance with 35 U.S.C. § 112.

The office action also objects to the wording of claims 1-14. In response, claims 1-2, 6-8 and 9-12 have been amended to traverse these objections. No new matter has been added thereby.

Next, the office action rejects claim 1 under 35 U.S.C. § 112 as allegedly being indefinite. In response, claim 1 has been amended to traverse this rejection. Claim 7 is also similarly rejected and claim 7 has been amended to traverse this objection.

Applicants respectfully submit that all § 112 objections and rejections regarding claims 1-2 and 4-14 have been addressed in the above amendment and that all § 112, second paragraph rejections should be withdrawn.

With respect to the rejections based upon the prior art, the Patent Office rejects claims 1-5 and 9-14 under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,093,632 ("Lin '632") in view of U.S. Patent No. 6,042,999 ("Lin '999"). Claim 1 has been amended to traverse this rejection.

At the outset, Applicants respectfully submit that this rejection does not meet the standards required for establishing a *prima facie* case of obviousness as set forth in § 2142 of the MPEP:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. MPEP § 2142.

Lin '632 does not teach or suggest a second etching stop layer that surrounds the inlet of its respective opening 12b. As shown in Fig. 7 of Lin, the etching stop layer 10b is etched together with the silicon oxide layer 13 beyond the inlet of the via opening 12b which extends through the oxide or insulating layer 4. As shown in Fig. 6 of Lin '632, after formation of the insulating layers 4 and 13 and the silicon islands 10b, an etching process for forming the openings 15b and 12b is carried out resulting in the islands 10b and the insulating layer 13 being set back from the inlet of the via 12b.

In stark contrast, claim 1 requires the second etching stop layer to be selectively etched so it produces an etching stop pattern around an inlet of the via hole. Claim 1 also requires the fourth insulating layer to be formed after forming the via hole and the etching stop pattern around the inlet of the via hole. Thus, the fourth insulating layer can be produced with a void B as shown in Fig. 3D. Nowhere in Lin '632 is this technique taught or suggested. Because Lin '632 is clearly deficient as a base reference, applicants respectfully submit that the obviousness rejections cannot stand.

Lin '999 is merely cited for the proposition that it discloses a dual damascene method. Lin '999, like Lin '632, fails entirely to teach or suggest the formation of an additional interlayer insulating layer after the formation of the via hole in an underlying third interlayer insulating layer resulting in a void in the fourth interlayer insulating layer. Lin '999 also fails to teach an etching stop pattern around the inlet of a via hole. Thus, no combination of the Lin patents teaches or suggests this technique and therefore the obviousness rejection of claims 1-5 and 9-14 as being unpatentable over the two Lin patents is improper and should be withdrawn.

Claims 6-8 stand rejected under 35 U.S.C. § 103 as being unpatentable over Lin '632, Lin '999 and U.S. Patent No. 6,268,2083 ("Huang"). The deficiencies of the two Lin patents are discussed above.

Huang, on the other hand, merely teaches the use of a cap layer to form a void in a via hole. However, applicants respectfully submit that the Huang reference should not be read that broadly. Huang teaches the formation of a cap layer 216 over a via hole and a hard mask layer 210. In contrast, claim 1 requires the formation of a fourth interlayer insulating layer on an etching stop pattern and a third interlayer insulating layer. Then, as shown in Fig. 3E of the present specification, when the fourth interlayer insulating layer is etched, the wider trench is created.

In contrast, the cap layer 216 of Huang is not selectively etched to create a wider trench at that point in the Huang structure as shown in Fig. 2D of Huang. In fact, the cap layer 216 and photoresist layer 224 are completely removed before the conductive layer 230 is deposited in Fig. 2E. Claim 1, on the other hand, requires a selective etching of the fourth interlayer insulating layer. Huang does not teach or suggest any selective etching of the cap layer 216.

Accordingly, applicants respectfully submit that the rejection of claims 6-8 under 35 U.S.C. § 103 as being unpatentable over Lin '632, Lin '999 and Huang is improper and should be withdrawn.

Applicants respectfully submit that all rejections and objections have been addressed and that this application is in a condition for allowance and an early action so indicating is respectfully requested.


The Commissioner is authorized to charge any fee deficiency required by this paper, or credit any overpayment, to Deposit Account No. 13-2855.

Respectfully submitted,

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By:



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